

"Preliminary results on $^{239+240}\text{Pu}$ and ^{238}Pu in some environmental samples of the Taranto Gulf"

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Abstracts

The researches on the Taranto Gulf environment, which the Istituto di Zoologia has been performing for about ten years now, are, at present, in progress with the collaboration of the researchers of CNEN for the determination of the contents of $^{239+240}\text{Pu}$ and ^{238}Pu in some marine samples of water, sediments, plankton and animals. The work reports the preliminary results obtained on a set of environmental samples collected in the years 1972-1974-1978.

1. Introduction

The aim of a general radioecological work on the Taranto Gulf environment is at determining the radioactivity base-line level before the beginning of the activities and discharges from the Trisaia Nuclear Centre located near the coast (~ 4 km) on the right side of the Sinni river. In the past, several radiochemical analyses were carried out to determine the main fission and activation products contained in different marine samples. More recently ⁽¹⁾, attention was paid to determine the content of alpha emitter isotopes of uranium, thorium and plutonium in the upper layer sediment samples, collected in different stations of the Taranto Gulf ^(2,3). The methods pointed up for uranium and thorium analyses ⁽⁴⁾ and for the selective radiochemical analysis of plutonium isotopes contain-

ed in different matrix samples (5) are described in detail elsewhere. It can be remarked that with the proposed methods herein applied, good decontamination factors from U, Th and Am were generally obtained for the different sample matrices considered, but only in the case of sediments having a high activity ratio - Th isotopes to Pu isotopes - decontamination from ^{232}Th and daughters was not always fully achieved.

Each analytical sample concerning this paper was traced with ^{236}Pu or with ^{242}Pu spikes and the following global separation yields were obtained:

- sea water : $62.6 \pm 9.8 \%$ on 4 samples
- sediment : $45.2 \pm 11.8\%$ on 5 samples
- organisms : $69.2 \pm 21.7\%$ on 7 samples

Electrodeposited alpha sources were counted by a 300 mm^2 silicon barrier detector having efficiency equal to $25.1 \pm 0.7\%$ for a 200 mm^2 electroplated ^{239}Pu source; the duration of the sample measurements was 6000 min. The values obtained by alpha spectrometry were corrected for reagent blank, counting efficiency, separation yield, and are reported in the present work.

Information on modalities of sample collection, position of sampling stations, grain-size distribution of sediment and so on are reported in other extensive papers (1,4).

2. Experimental results

- Sea water samples (200 l) collected in May 1972 (SW.1) and in May 1978 (SW.2) showed the following concentrations ($\pm \sigma$ due to the counting) and plutonium isotope ratios

	$^{239+240}\text{Pu}$ fCi/l	^{238}Pu fCi/l	$\frac{^{238}\text{Pu}}{^{239+240}\text{Pu}}$
SW.1	1.51 ± 0.09	0.10 ± 0.02	0.06
SW.2	1.32 ± 0.07	0.04 ± 0.01	0.03

- Sediment samples (100 g dry) collected in October 1974 (L type) and in July 1972 (ST type) were partially analysed for determining the vertical radioactivity distributions along the core and preliminary results are reported in Table 1.

The mixed sample εL consisted of grabbed samples collected near the coast at about 10 m depth; the other samples were cored in different zones as showed in Figure, around the 100 m batimetric line, and grouped for the radiochemical analysis.

- Results concerning neritic plankton (60-70% copepoda content) and marine organisms are reported in Table 2. About half a kilogram of dried material was considered for the radiochemical analysis of the neritic and beritic animal samples. Moreover a plankton sample of about 60 g dry was considered. The data reported are comparable with the plutonium isotope amounts deriving from the local fall out and are similar to those of other samples collected in different zones of the Mediterranean Sea (6,7,8), taking into account the proper characteristics of each sample.

3. References

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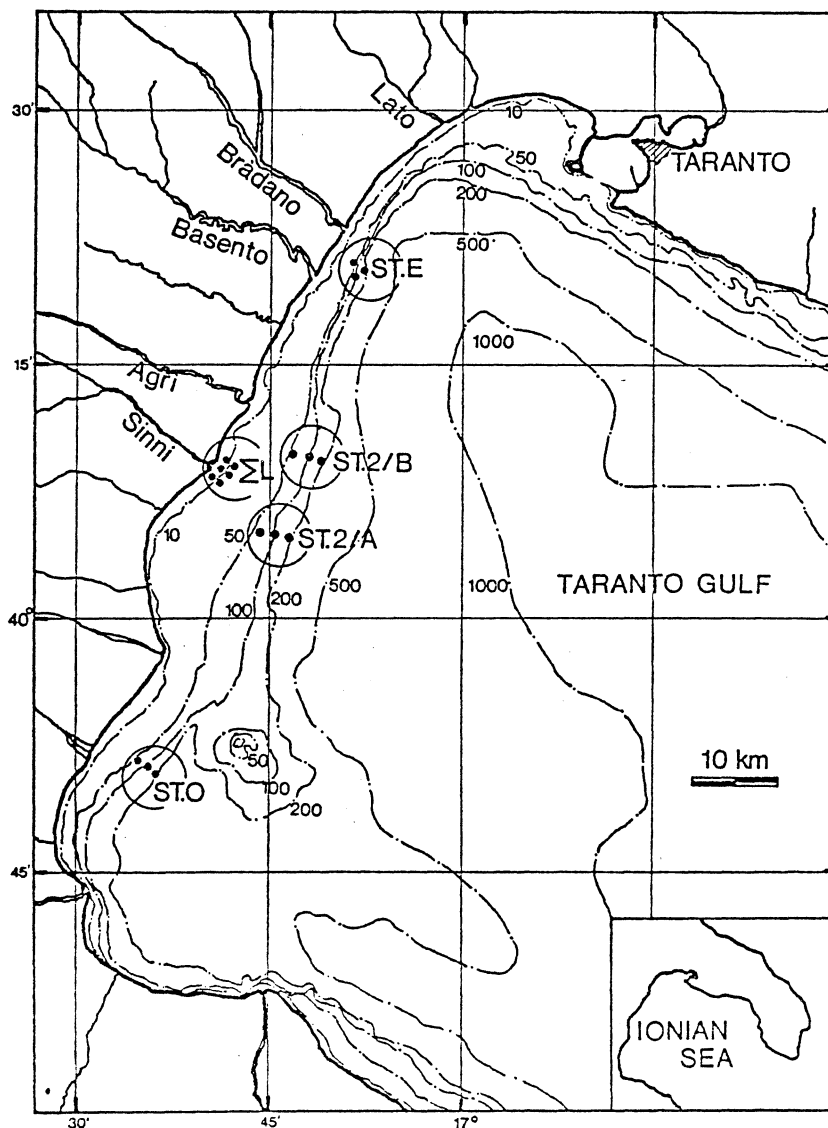


TABLE 1 - Data on marine sediments.

Sample	thickness from surface cm	^{238}Pu	
		$\frac{^{238}\text{Pu}}{^{239}+^{240}\text{Pu}}$	$^{239}+^{240}\text{Pu}$ pCi/kg dry
ΣL	0-2		1.98
ST.O	0-6		14.30
ST.2/A+B	0-6		13.56
ST.2/A	0-6	0.11	9.67
"	6-10	0.12	11.70
"	10-15		1.65
ST.2/B	0-6		17.45
"	6-10		16.98
"	10-15		13.45
ST.E	0-6	0.06	12.67

TABLE 2 - Data on marine organisms.

Sample	^{238}Pu		
	$\frac{^{238}\text{Pu}}{^{239}+^{240}\text{Pu}}$	$^{239}+^{240}\text{Pu}$ pCi/kg dry	$^{239}+^{240}\text{Pu}$ pCi/kg wet
<u>Merluccius Merluccius</u>	0.11	0.144	0.030
<u>Gobius niger</u>	0.05	0.963	0.231
<u>Gobius niger</u>	0.04	0.798	0.192
<u>Eledone muscata</u> and <u>Octopus vulgaris</u>		0.216	0.052
<u>Solea Lascaris</u>	0.04	0.176	0.042
<u>Solea vulgaris</u>	0.03	0.148	0.035
Plankton	0.04	3.020	0.175

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Paper presented by C. Triulzi (Italy)

Discussion

H.D. LIVINGSTON: Have you tested your procedure for Pu analysis on any of the samples of marine origin distributed for purposes of laboratory intercomparison?

C. TRIULZI: Yes, we have. We have participated in the IAEA intercampaign exercises making analysis of sample SW-I-3, containing 103 ± 7 ^{239}Pu and 18 ± 1 ^{238}Pu . The radiochemical analysis directly performed on the sample as received has given the following values:

101 ± 7 fCi ^{239}Pu and 17 ± 3 fCi ^{238}Pu

whereas the analysis on a diluted 1:5 by 5W sample has given

111 ± 7 fCi ^{239}Pu and 17.6 ± 4 fCi ^{238}Pu

At present, IAEA samples are being analysed for the determination of Pu isotopes in sediments (SD-B-3).

J.C. GUARY: Comment expliquez-vous les hautes concentrations en Pu trouvées chez Gobius niger, dix fois plus fortes que chez les autres poissons analysés?

C. TRIULZI: I think that a biologist attending this conference, namely dr. Schulte, can better than I explain this fact. Dr. Schulte has in fact participated as a researcher from CNEN of Fiascherino in the sample collection campaign in the Taranto Gulf.

E.H. SCHULTE: Gobius niger can in fact supply very interesting information on the zone where it is caught, since it is little mobile and lives in the same place where it was born, eating crustaceans (crayfish, small fishes), it is a second order consumer. This species is very common, peculiar of sandy, muddy and detritical sea-bottoms. It is trawled.

H.D. LIVINGSTON: Do you know if the low Pu concentration measured for your sediment sample ΣL is related to the sediment grain size?

C. TRIULZI: Sample L has a grain size different from that of samples ST, because it was collected at a depth of 5-10 m near the coast. The granulometric distribution (%) is, in fact, on an average, see following:

μm	>250	250÷125	125÷62	<62
" ΣL " sample	27	57	15	1
"ST" sample	1	21	22	56

